

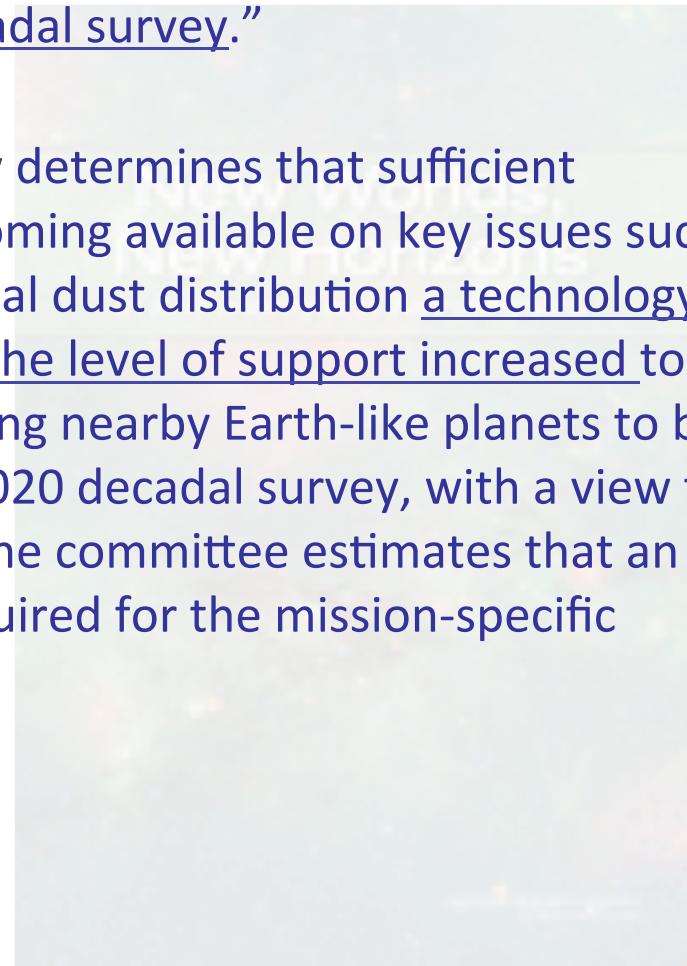


Forecast of Exoplanet Exploration Program Plans and Opportunities

M. Devirian
June 1, 2011



- Astro2010, *New Worlds New Horizons*, has provided guidance on the path forward:
 - “The committee’s proposed program is designed to allow a habitable-exoplanet imaging mission to be well formulated in time for consideration by the 2020 decadal survey.”
 - “If, by mid-decade, a DSIAC review determines that sufficient information has become or is becoming available on key issues such as planet frequency and exozodiacal dust distribution a technology down-select should be made and the level of support increased to enable a mission capable of studying nearby Earth-like planets to be mature for consideration by the 2020 decadal survey, with a view to a start early in the 2020 decade. The committee estimates that an additional \$100 million will be required for the mission-specific development.”

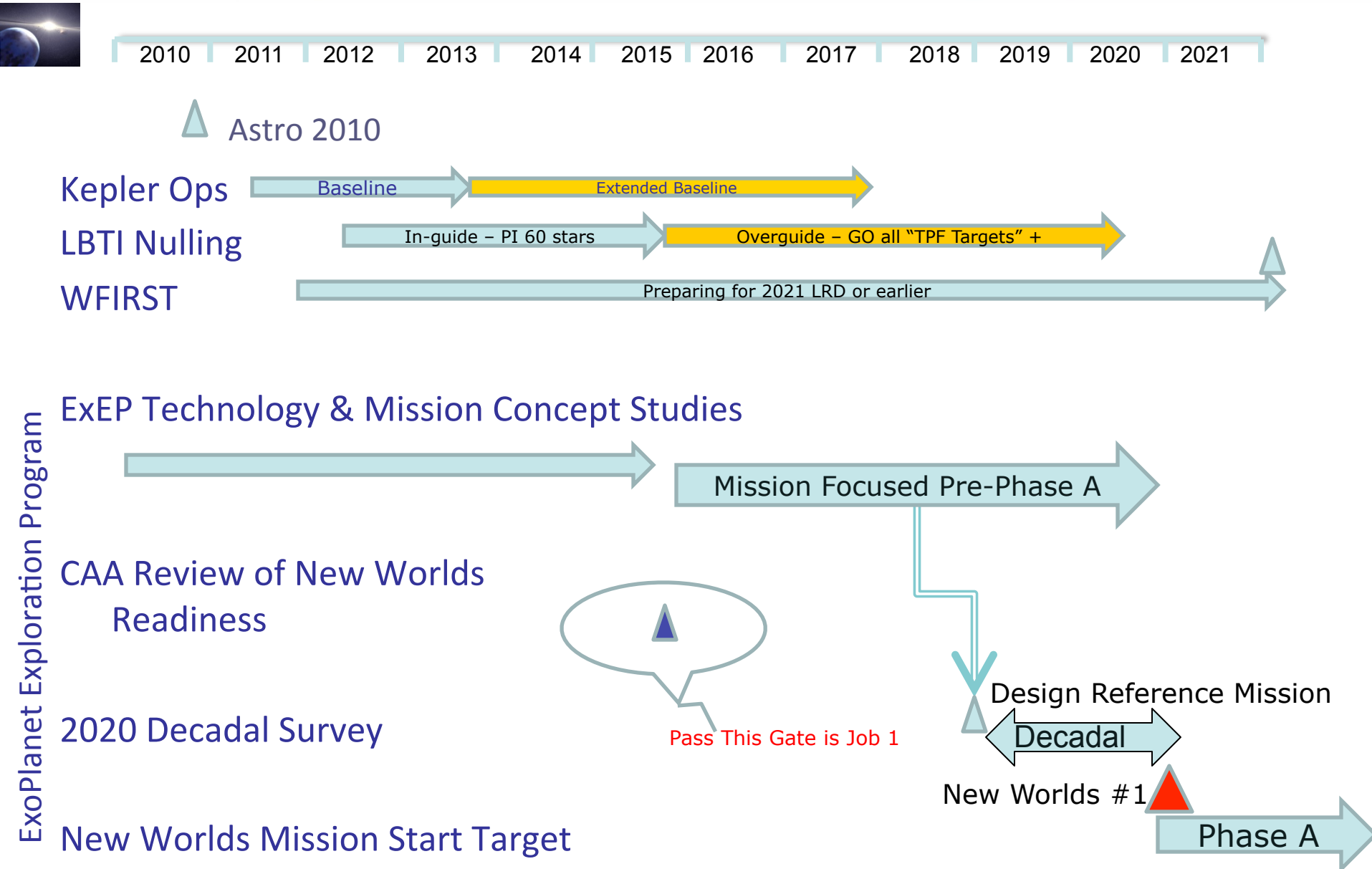


Plan Elements according to Astro2010



- 1st, understand the demographics of other planetary systems, in particular to determine over a wide range of orbital distances what fraction of systems contain Earth-like planets
 - WFIRST to complement Kepler (but not in time to affect Astro2020)
- 2nd, characterize the level of zodiacal light present so as to determine, in a statistical sense if not for individual prime targets, at what level starlight scattered from dust will hamper planet detection
- *“After these essential measurements are made, the need for a dedicated target finder can be determined and the approach for a space-imaging mission will be clear.”*

10 Year Planning Framework



Planning Framework Adopted by ExoPAG-3



Present - Spring 2012

- ExoPAG define minimum NW science requirements for top Astro2020 rating.
- ExoPAG define ground-rules and technical framework for concept studies.
- *New: ExoPAG and CORPAG starting joint look at combined exoplanet/UVO mission.*

Summer 2012

- NASA Headquarters issues *solicitation for participation in Interim Science Working Groups* (ISWG) to conduct (funded) concept studies; membership of working groups selected by end of 2012.

Jan. 2013

- Concept studies begin.

Jan. 2014

- Concept study reports completed and submitted to NASA

Summer 2014

- Senior Review-style evaluation of the concept study reports conducted.
 - Organized by NASA HQ
 - ISWGs present the results of their study in a face-to-face meeting with review panel, discuss any issues/questions with the panel.

December 2014

- Review panel submits report to NASA summarizing their findings and recommendations for the architecture downselect.

2015

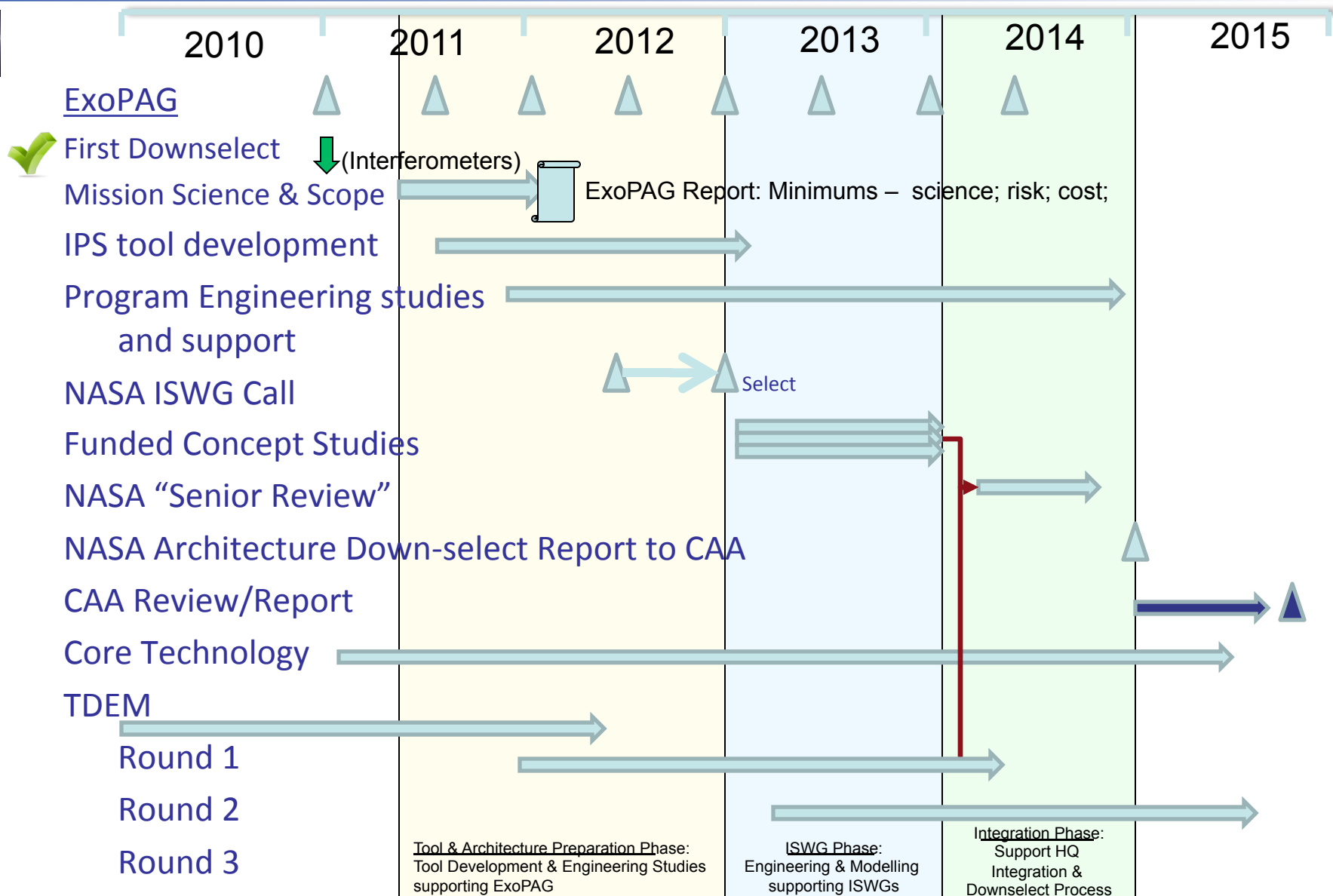
- Report and resultant NASA decisions fed into DSIAC. (CAA)

Resources for a New Worlds Mission



- Many references in Astro2010 report to preparing for NW mission, including investment of “\$100M – 200M for mission specific development” over this decade, subject to review by NRC committee mid-decade.
- Resources to prepare are contained in ExEP SR&T funding lines.
 - Planning is consistent with upper end of the decadal recommendation.
 - Resources include technology development and mission concept development:
 - ISWGs selected through NASA call for *tbd* number of concepts.
 - Supporting modeling and engineering studies provided by ExEP program.
 - Current budget planning specifics are embargoed.







A 5-Year Horizon



Considerations on Mission Architectures



- ExoPAG exploring potential joint mission with UVO community.
 - Aperture
 - Coatings
- Tool & Architecture Preparation Phase
 - Build strawman models with parameters based on Astro2010 recommendation of ~4m aperture telescope.
 - Prepare for coronagraph, starshade and visible nuller architectures.
 - Nullers less mature; likely use only to enable segmented aperture.
- ISWG Phase
 - ISWGs can tune all parameters to optimize their concept.
 - Aperture size will be open (but is a significant cost-driver).
- Integration & Report Phase
 - NASA/ExEP can apply programmatic constraints to viable concepts.

Aperture	~4-6m (classical)	>6m (segmented)
Coronagraph		Size not req'd for exoplanets; don't work with segments 
Starshade		
Visible Nuller	Less mature; use only if needed for large aperture 	

Post-CAA notional activities



2016 - 2019

- Form New Worlds Pre-Project Office, or “Study Office”
- Solicit Science Definition Team (SDT)
- Develop Design Reference Mission (DRM) for submittal to “Astro2020”
- Disband SDT

2019 – 2020

- Decadal deliberations
- NW gets #1 recommendation

2021

- Form Pre-Phase A NW Project
- Solicit Science Working Group
- Prepare for Confirmation Review

Note: all depends on JWST launch, Hubble de-orbit mission, other unknowns.



END